Break-Out Group on Long Term Data Needs

The breakout group on long term data pursued issues related to the availability of satellite and in situ data needed for land cover and land use change studies. In particular, the discussion dealt with data needs in the post-Landsat and post-EOS era.

Land cover and land use change data were viewed in a broad context that includes a broad range of attributes and measurements. In addition to their multi-dimensional information content, land cover and land use change data must have a strong temporal component. All attributes of land cover and land use vary over time. Both baseline measurements, change vectors, and continuous monitoring data sets are essential. Examples of land cover and land use measurements include:

Land Cover

- Physiognomic characteristics (e.g., vegetation density, height, longevity, form)
- Floristic characteristics (e.g., community composition, species)
- Biophysical characteristics (e.g., phenology, trace gas fluxes, net primary productivity)
- Successional stage, disturbance history
- Land cover types

Land Use

- Management intensity practices
- Soil condition
- Economic activity
- Land use types

While there are currently both geographic and thematic gaps in both land cover and land use data coverage, many of the land cover gaps will be reduced or eliminated when data products that will be generated through the Earth Observing System become available. However, land use data gaps will remain and must be addressed.

There are some general trends in land cover and land use data that are relevant when considering the specifications of the future satellite and sensor configurations from which these data will be derived. They include:

X Land cover and land use data requirements arel becoming increasingly quantitative.

X Monitoring will always be a multi-resolution activity, and the importance and dimensions of multi-resolution analysis will continue to increase.

X The data spatial and spectral resolutions that will be used will need to increase incrementally over time. In addition, the repeat frequency of intermediate resolution data collection systems, such as Landsat, should be narrowed.

- X There is currently a void between 30m and 1000m observations. Regional monitoring (i.e., national to continental scales) require data resolutions inbetween current capabilties.

- X There is an urgent need to monitor certain regions (i.e., tropical landscapes) and resources (i.e., agriculture, forestry) at higher resolutions and with greater temporal frequency and spatial resolutions. Tropical landscapes are an example.

- X Inter- and intra sensor calibration and atmospheric corrections are mandatory. Measurements must be comparable over time.

- X Validation must be an essential element of all data production programs.

Significant attention must be given to future satellite programs that collect the remotely sensed data from which land cover and land use data will be derived. While the near term is well-defined with the continuation of an enhanced Landsat program, new data from sensors onboard the EOS-AM platform, and innovative missions such as the Vegetation Canopy Lidar, the future is quite unclear. Because of the uncertainty concerning future missions, a series of general statements concerning the characteristics of the future generations of earth observation satellites were developed. They are:

- X Environmental data and environmental monitoring are everybody=s business (science community, government, industry). The same data used for scientific purposes are important for resource management and planning, and econonmic development. Thus, all sectors should work together to ensure viable long-term monitoring programs.

- X Decisions on future operational satellite capabilities (e.g., NPOESS) are being made before research and development results are available. For example, the transition from AVHRR to NPOESS will be based on decisions that are made without the benefit of lessons learned from the MODIS experience. It is important that the successful capabilties of MODIS and other satellites be included in future satellite configurations.

- X Related to the previous issue, it is essential that there be continuity in the successful and useful data products between missions. In addition, the characteristics of products must be planned in an evolutionary context. New missions should include the beneficial characteristics of previous missions, while making incremental improvements in observation and measurement products. In other words, products must get better over the long term.

- X An unbroken temporal record, wihout reduced capabilties, is essential so that there is a consistent and reliable long-term time series with no gaps. In the case of the transition between AVHRR, MODIS, and NPOESS, it is important that the time series be unbroken and that there be no reduction in observation data quality. This suggests that MODIS be continued for an additional cycle so that there is no gap between the planned MODIS sensors on EOS-AM and -PM and NPOESS.

X New data products must have links to past products. This means that issues of inter- and intra-sensor calibration and data set reprocessing must be planned, funded, and completed.

X Access to data should be direct, and ideally, seamless. The challenges in dealing with foreign ground stations must be addressed so that past problems in obtaining data over foreign areas are reduced or eliminated.

X Geographic gaps in data coverage must be reduced, either through advances in recording and downlinking, or through improved network of cooperating ground receiving stations. There is a need for a long term strategy to work in partnership with foreign ground stations.

X Private sector and government cooperation must be used to the advantage of all parties. With the increasing involvement of the private sector in satellite missions, it is important that scientific interests be weighted and negotiated with commercial interests. This suggests that a long-term strategy is needed to "acquire" acquisition time in order to ensure that the data needed for monitoring and validation be available.

X Hyper-spatial data (< 3m resolution) are important for a variety of scientific purposes. However, there is some concern that data that will become available in the near future are not designed for scientific purposes, and may be two expensive for scientific activities. The ideal system should have narrow-band multispectral channels and have data calibration capabilities. The data must be affordable and available to the scientific community. Data acquisition strategies must be sensitive to the needs for data within narrow temporal windows and coincident with other satellite overpasses. The science community needs a voice and a mechanism for influencing acquisition plans so the required data are available.

X NASA must play a lead role in stimulating new research and development missions. Candidates include multi-frequency, multi-polarization SAR, hyperspectral, and lidar missions. In addition, NASA should sponsor a viable research program on remote sensing methods that leads to new products. Finally, there is a need for proof-of-concept studies that provide the applied research that bridges basic research and operational applications.

X In situ measurements are essential complements to the long-term satellite record. It is important that an organization come forward and take the lead in advocating for a long-term in situ data collection network. One possible organization is the Global Terrestrial Observing System (GTOS).

Finally, it is important to reiterate the importance of ensuring that successful missions that have produced or led to important new monitoring capabilities and products be continued without reduction of critical characteristics. Because of the need for long-term continuity without decay in capabilities or gaps in coverage, continuation of missions such as Landsat and EOS (especially the MODIS sensor) are mandatory if long-term monitoring are to meet the diverse national needs.